Protons, Neutrons, and Electrons Practice Worksheet

Fill in the blanks in the following worksheet. Please keep in mind that the isotope represented by each space may NOT be the most common isotope or the one closest in atomic mass to the value on the periodic table.

Atomic symbol	Atomic number	Protons	Neutrons	Electrons	Mass Number
B	5	5	6	5	11
Na	11	11	13	11	24
Ga	31	31	37	31	68
Y	39	39	50	39	89
Cu	29	29	35	29	64
Tc	43	43	57	43	100
Pb	82	82	125	82	207
Yb	70	70	102	70	172
Ac	89	89	136	89	225
Mo	42	42	53	42	95
Tl	81	81	125	81	206
Fm	100	100	159	100	259
No	102	102	159	102	261
Yb	70	70	102	70	172
Sg	106	106	159	106	265

Atomic Mass Problems

1. Calculate the weight of silicon using the following data for the percent natural abundance and mass of each isotope:
   92.23% ^{28}Si (27.9769 amu); 4.67% ^{29} Si (28.9765); 3.10% ^{30}Si (29.9738 amu).

$^{28}Si = 0.9223 \times 27.9769 = 25.8031$
$^{29}Si = 0.0467 \times 28.9765 = 1.35$
$^{30}Si = 0.0310 \times 29.9738 = +0.929$
28.08

2. Thallium has two stable isotopes, ^{203}Tl and ^{205}Tl. Knowing that the atomic weight of thallium is 204.4, which isotope is the more abundant of the two?

Because atomic mass is the weighted average mass of all isotopes of an atom, the most abundant isotope in this case must be Tl-205. If each istope existed equally in nature, the mass would be 204. Because it is 204.4 it is closer to the mass of 205 which means that 205 is more abundant.

3. Verify that the atomic mass of magnesium is 24.31, given the following:

^{24}Mg= 23.985042amu, 78.99%	^{25}Mg= 24.985837 amu, 10.00%	^{26}Mg= 25.982593, 11.01%

$^{24}Mg = 23.985042 \times 0.7899 = 18.95$
$^{25}Mg = 24.985837 \times 0.1000 = 2.500$
$^{26}Mg = 25.982593 \times 0.1101 = +2.861$
24.31

4. Copper exists as two isotopes: ^{63}Cu (62.9298 amu) and ^{65}Cu (64.9278 amu). What are the percent abundances of the isotopes?

Nothing this difficult will be on the test but here is the solution anyways.

Atomic mass of Cu = 63.55 (from Periodic Table)

$62.9298x + 64.9278(1-x) = 63.55$

$62.9298x + 64.9278 - 64.9278x = 63.55$

$-1.938x = -1.3778$

$x = .7109$

$x = 71.09\%$ Cu-63

$1-x = 1-0.7109 =$

Nuclear Chemistry Worksheet-

Show "K-U-E-S" where necessary, otherwise answer completely. Work that does not fit in the provided space needs to be completed on your own paper.

Part A: Completing Nuclear Decay Reactions: 1-10

For each of the atoms listed below, complete the decay reaction by solving for ${}^{A}_{Z}X$ or other missing information. Remember that the mass and protons on each side of the arrow need to equal each other.

$^{256}_{103}Lr \rightarrow {}^{4}_{2}He + {}^{A}_{Z}X$ = $^{252}_{101}Md$

$^{247}_{Z}Am \rightarrow {}^{0}_{-1}e + {}^{A}_{Z}X$ = $^{247}_{96}Cm$ ($Z = 95$)

$^{215}_{89}Ac = {}^{A}_{Z}X \rightarrow {}^{211}_{87}Fr + {}^{4}_{2}He$

$^{175}_{93}Np \rightarrow {}^{4}_{2}He + {}^{A}_{Z}X$ = $^{171}_{91}Pa$

$^{6}_{2}He \rightarrow {}^{0}_{-1}e + {}^{A}_{Z}X$ $^{6}_{3}Li$

$^{13}_{5}B \rightarrow {}^{0}_{-1}e + {}^{A}_{Z}X$ = $^{13}_{6}C$

$^{211}_{79}Au \rightarrow {}^{0}_{-1}e + {}^{A}_{Z}X$ $^{211}_{80}Hg$

$^{151}_{67}Ho \rightarrow {}^{4}_{2}He + {}^{A}_{Z}X$ = $^{147}_{65}Tb$

~~$^{A}_{Z}X \rightarrow {}^{0}_{-1}e + {}^{213}_{Z}Po$~~

$^{148}_{57}La \rightarrow {}^{4}_{2}He + {}^{A}_{Z}X$ = $^{144}_{55}Cs$

Part B: Writing Nuclear Decay Reactions:

Write equations for the following nuclear decay reactions. Make sure that both mass numbers and atomic numbers are balanced on each side

11. Decay of polonium-218 by alpha (α) emission.

$^{218}_{84}Po \rightarrow {}^{4}_{2}He + {}^{214}_{82}Pb$

12. Decay of carbon-14 by beta (β-) emission.

$^{14}_{6}C \rightarrow {}^{0}_{-1}\beta + {}^{14}_{7}N$

13. The alpha decay of radon-198

$^{198}_{86}Rn \rightarrow {}^{4}_{2}He + {}^{194}_{84}Po$

14. The beta (β-) decay of uranium-237

$^{237}_{92}U \rightarrow {}^{0}_{-1}\beta + {}^{237}_{93}Np$